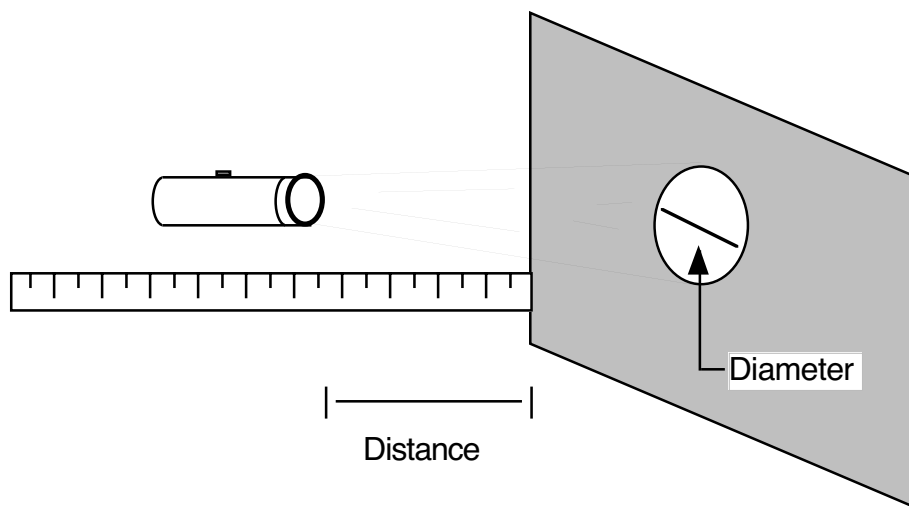


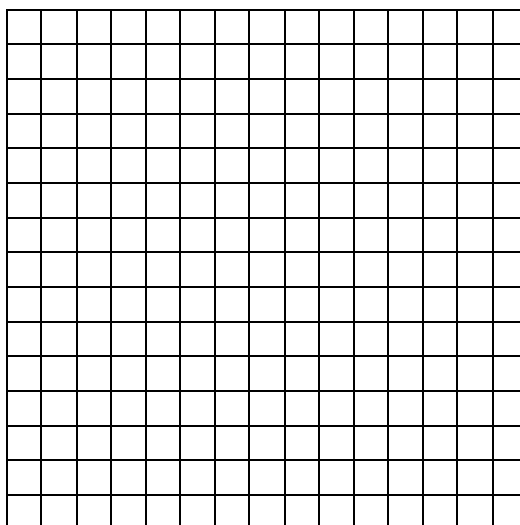
## Activity 2: UCO's

What is the relationship between the diameter of the circular light pattern cast by a flashlight and the flashlight's distance from the circular light pattern?



Vary the distance of the flashlight from the surface and measure the diameter of the circular light pattern cast by the flashlight.

1. Sketch a graph predicting the relationship between the diameter of the circular light pattern cast by a flashlight and the flashlight's distance from the circular light pattern.

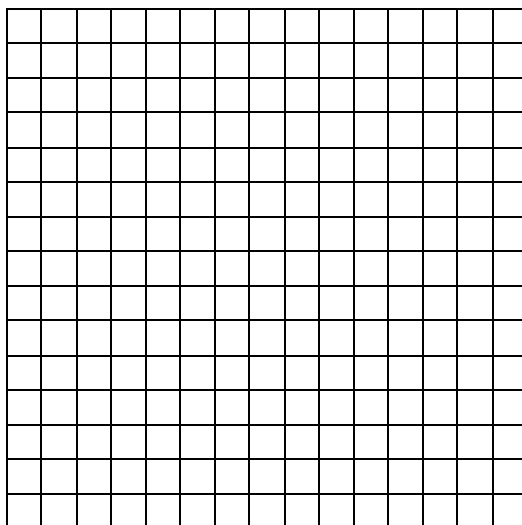


## 2. Data Collection

Hold a yardstick perpendicular to a flat surface, such as a table, with the end starting at 0 on the flat surface. Hold a flashlight next to the meter stick so that it will cast light on the flat surface. Place the rim of the flashlight (light source end) at 1 cm and measure the diameter of the distinct circular pattern formed on the flat surface. Record in the table below. Continue to vary the distance of the flashlight from the table and record the diameter of the circle formed.

Distance (cm)	Diameter
1	
2	
3	
4	
5	
6	
9	
10	

3. Make a scatter plot using a graphing calculator. Sketch below.



4. Use first differences to estimate a rate of change.
5. Estimate the  $y$ -intercept (*starting point*.)
6. Find a trend line for the data using the estimated rate and  $y$ -intercept.
7. Graph your trend line over the scatter plot and adjust the parameters  $y$ -intercept and *rate of change*, if necessary, for a better fit.
8. What are the units of slope for the trend line?
9. What is the meaning of the  $y$ -intercept in the trend line?
10. Use the trend line to determine the diameter of the circle when the flashlight is 15 cm from the flat surface. Write the equation and solve in at least three ways.

11. Use the trend line to determine how far the rim of the flashlight is from the flat surface if the diameter of the circle is 18 cm. Write the equation and solve in at least four ways.
12. Make a general statement about the relationship between the distance of the flashlight from the surfaces and the diameter of the circular light pattern produced on the surface.

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## Sample Assessment

A group collected the following data for Unidentified Circular Objects.

Distance (cm)	Diameter (cm)
1	5
2	6.4
3	8
4	9.6
5	11

1. Create a scatter plot and find a trend line. Sketch both in an appropriate window.
2. Use the graph to determine what the diameter of the circular light pattern is when the flashlight is 3.5 cm from the surface. Show on the graph how you found the answer.
3. Use the graph to determine how far the flashlight is from the surface when the diameter of the circular light pattern is 20 cm. Show on the graph how you found the answer.